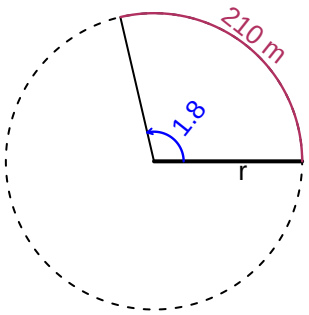
Name: Date:

Trig Final (SLTN v641)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.8 radians. The arc length is 210 meters. How long is the radius in meters?

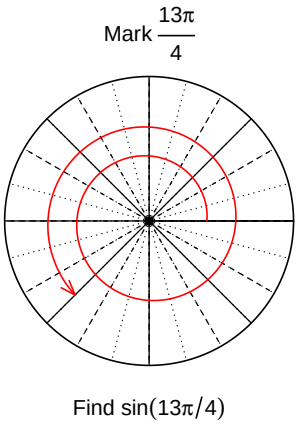


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

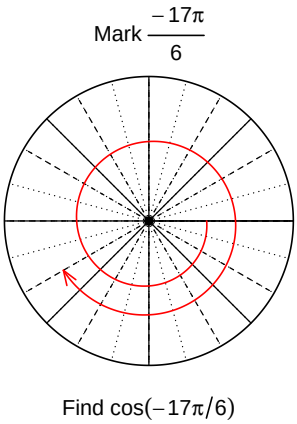
$r = 116.7$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-17\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(13\pi/4)$



Find $\cos(-17\pi/6)$

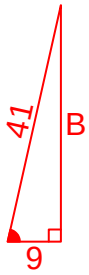
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{9}{41}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

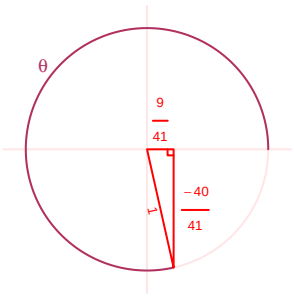
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$
$$B = \sqrt{41^2 - 9^2}$$
$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-40}{41}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.28 meters, a frequency of 3.49 Hz, and a midline at $y = -2.42$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.28\cos(2\pi 3.49t) - 2.42$$

or

$$y = -6.28\cos(6.98\pi t) - 2.42$$

or

$$y = -6.28\cos(21.93t) - 2.42$$